

Name _____ Date _____ Period _____

Find the value for the function.

1. Find $f(-2)$ when $f(x) = \frac{x-2}{x^2+5}$.

$$f(-2) = \frac{(-2)-2}{(-2)^2+5} = \boxed{\frac{-4}{9}}$$

2. Find $f(4)$ when $f(x) = -2x^2 + x - 1$.

$$f(4) = -2(4)^2 + (4) - 1 = -32 + 4 - 1 = \boxed{-29}$$

3. Find $f(-x)$ when $f(x) = \frac{2x}{x^2-7}$.

$$f(-x) = \frac{2(-x)}{(-x)^2-7} = \boxed{\frac{-2x}{x^2-7}}$$

4. Find $f(x+1)$ when $f(x) = 3x^2 + 5x - 7$.

$$\begin{aligned} f(x+1) &= 3(x+1)^2 + 5(x+1) - 7 \\ &= 3(x^2 + 2x + 1) + 5x + 5 - 7 \\ &= 3x^2 + 6x + 3 + 5x - 2 = \boxed{3x^2 + 11x + 1} \end{aligned}$$

Find the domain of the function.

5. $f(x) = \frac{5x}{x^2-49}$

$$(x+7)(x-7)$$

$$(-\infty, -7) \cup (-7, 7) \cup (7, \infty)$$

6. $f(x) = \sqrt{15-3x}$

$$15-3x \geq 0$$

$$\frac{-3x}{-3} \geq \frac{-15}{-3}$$

$$\boxed{x \leq 5 \text{ or } (-\infty, 5]}$$

7. $f(x) = -2|x| + 8$

$$(-\infty, \infty)$$

For the given functions f and g , find the requested function and state its domain.

8. $f(x) = \frac{2x-3}{x+5}$; $g(x) = \frac{2-x}{x+5}$. Find $f+g$.

$$f(x) + g(x) = \frac{2x-3}{x+5} + \frac{2-x}{x+5} = \frac{x-1}{x+5}$$

$$D: (-\infty, -5) \cup (-5, \infty)$$

9. $f(x) = \sqrt{2x}$; $g(x) = 2x-7$. Find $\frac{f}{g}$.

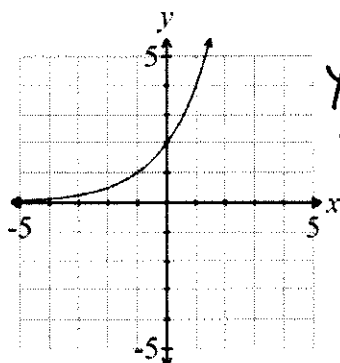
$$\frac{f(x)}{g(x)} = \frac{\sqrt{2x}}{2x-7} \rightarrow x > 0$$

$$2x-7 \rightarrow x \neq 7/2$$

$$\text{Domain: } [0, 7/2) \cup (7/2, \infty)$$

Determine whether the graph is that of a function. If it is, use the graph to find its domain and range, the intercepts, if any, and any symmetry with respect to the x -axis, the y -axis, or the origin.

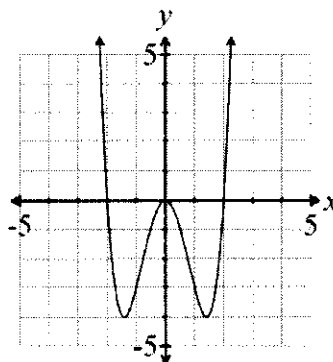
10.



Yes, a function

$D: (-\infty, \infty)$ $R: (0, \infty)$ y -int: $(0, 2)$
no symmetry no x -int

11.



Yes, a function

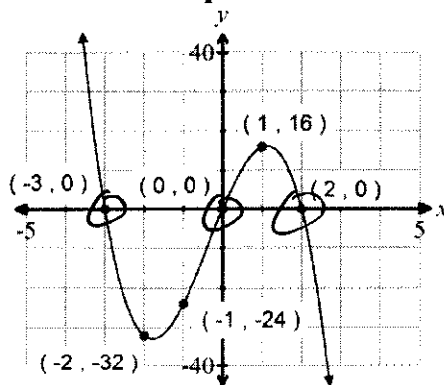
$D: (-\infty, \infty)$ $R: [-4, \infty)$
 x -int: $(-2, 0)$ $(0, 0)$ $(2, 0)$
 y -int: $(0, 0)$
Symmetry with respect to y -axis

The graph of a function f is given. Use the graph to answer the questions 12 & 13.

12. Find $f(1)$. 16

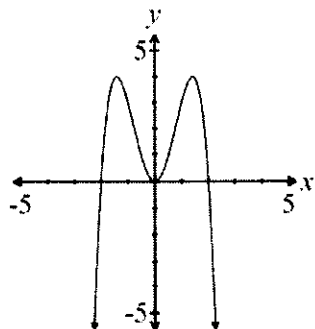
13. For what numbers x is $f(x) = 0$?

$x = -3$
 $x = 0$
 $x = 2$



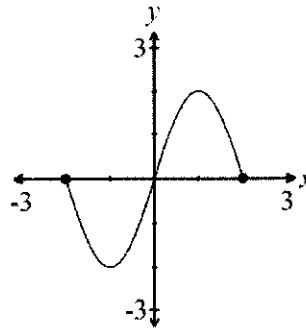
The graph of a function is given. Decide whether it is even, odd, or neither.

14.



even
(Symmetrical w/respect to y -axis)

15.



odd
(Symmetrical w/respect to origin)

Determine algebraically whether the function is even, odd, or neither.

16. $f(x) = \frac{2x}{3x^2 - 5}$

$$f(-x) = \frac{2(-x)}{3(-x)^2 - 5} = \frac{-2x}{3x^2 - 5} \text{ not even}$$

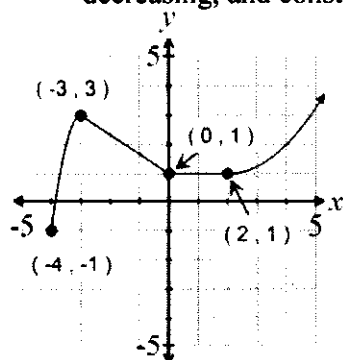
$$-f(x) = -\left(\frac{2x}{3x^2 - 5}\right) = \frac{-2x}{3x^2 - 5} \text{ odd}$$

17. $f(x) = \frac{|x|}{x^2}$

$$f(-x) = \frac{|-x|}{(-x)^2} = \frac{|x|}{x^2} \text{ even}$$

The graph of a function f is given. Use the graph to answer the question.

18. Find the intervals on which the function is increasing, decreasing, and constant.



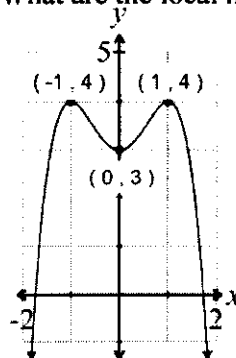
Inc.: $(-4, -3) \cup (2, \infty)$

Dec.: $(-3, 0)$

Const.: $(0, 2)$

19. Find the numbers, if any, at which f has a local maximum.

What are the local maxima?



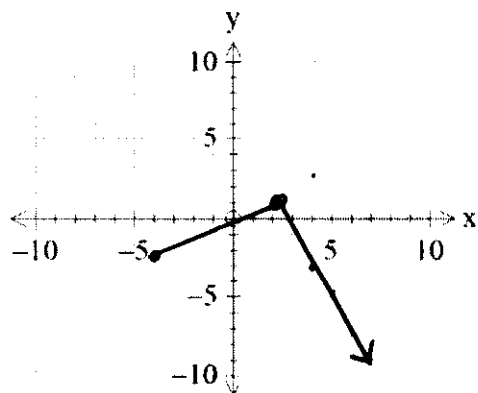
local max at $x = -1$

and $x = 1$

local max. value is $y = 4$ at each x .

Graph the function.

20. $f(x) = \begin{cases} \frac{1}{2}x & \text{if } -4 \leq x < 2 \\ -2x + 5 & \text{if } x \geq 2 \end{cases}$



$$y = \frac{1}{2}x$$

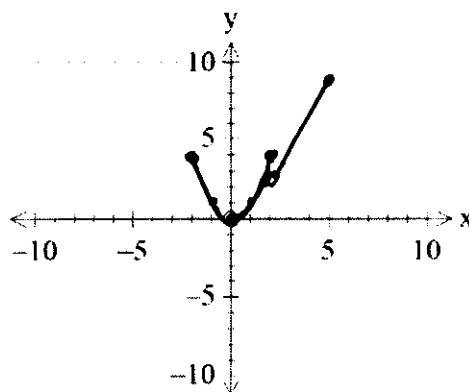
x	y
-4	-2
-3	-3/2
-2	-1
-1	-1/2

2 | 1 → open

$$y = -2x + 5$$

x	y
2	1
3	-1
4	-3

21. $f(x) = \begin{cases} x^2 & \text{if } -2 \leq x \leq 2 \\ 2x - 1 & \text{if } 2 < x \leq 5 \end{cases}$



$$y = x^2$$

x	y
-2	4
-1	1
0	0
1	1
2	4

$$y = 2x - 1$$

x	y
2	3 - open
3	5
4	7
5	9

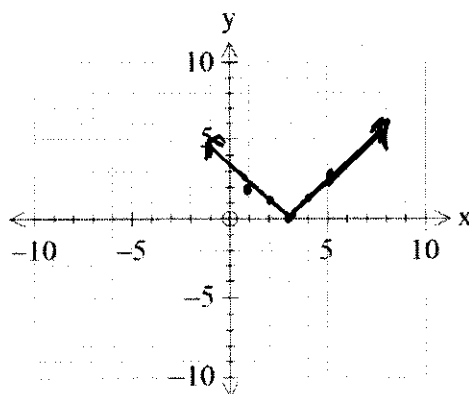
Graph the function by starting with the graph and table of key points from the parent function and then using the techniques of shifting, compressing, stretching, and/or reflections.

22. $f(x) = |x - 3|$ Right 3

$$y = |x|$$

x	y
-2	2
-1	1
0	0
1	1
2	2

x+3	y
1	2
2	1
3	0
4	1
5	2



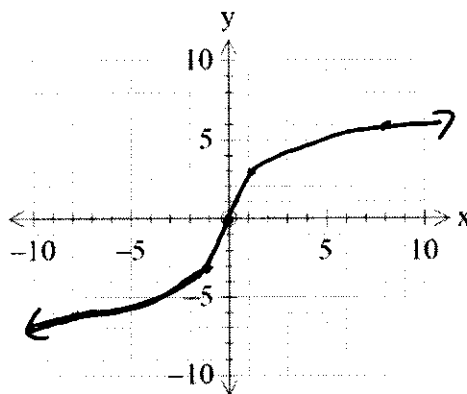
23. $f(x) = 3\sqrt[3]{x}$

$$y = \sqrt[3]{x}$$

x	y
-8	-2
-1	-1
0	0
1	1
8	2

vertical stretch
by 3

x	3y
-8	-6
-1	-3
0	0
1	3
8	6



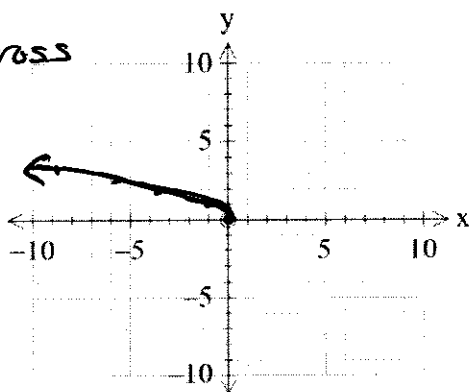
24. $f(x) = \sqrt{-x}$

$$y = \sqrt{x}$$

Reflection across
y-axis

x	y
0	0
1	1
4	2
9	3

-x	y
0	0
-1	1
-4	2
-9	3



Write an equation that results in the indicated translation.

25. The square root function, shifted 2 units downward.

$$y = \sqrt{x} - 2$$

26. The reciprocal function, shifted 3 units to the left.

$$y = \frac{1}{x+3}$$

Find the function.

27. Find the function that is finally graphed after the following transformations are applied to the graph of $y = x^2$. The graph is shifted left 5 units, stretched vertically by a factor of 2, shifted vertical up 7 units, and finally reflected across the x -axis.

1. $y = (x+5)^2$ 3. $y = 2(x+5)^2 + 7$
 2. $y = 2(x+5)^2$ 4. $y = -[2(x+5)^2 + 7]$ or $-2(x+5)^2 - 7$

Find the domain of the rational function.

28. $R(x) = \frac{x-5}{x^2+3x+2}$ $x \neq -2, x \neq -1$
 $(x+2)(x+1)$

$$(-\infty, -2) \cup (-2, -1) \cup (-1, \infty)$$

29. $R(x) = \frac{x^2+3x}{x^2-x-12}$ $x \neq 4$
 $(x-4)(x+3)$ $x \neq -3$

$$(-\infty, -3) \cup (-3, 4) \cup (4, \infty)$$

Find the vertical asymptotes of the rational function.

30. $R(x) = \frac{7}{x^2+3x-40}$ $x \neq -8$
 $(x+8)(x-5)$ $x \neq 5$

$$VA: x = -8, x = 5$$

31. $R(x) = \frac{-x^2+4x-4}{x^2-5x+6}$ $= \frac{-(x^2-4x+4)}{(x-3)(x-2)} = \frac{-(x-2)(x-2)}{(x-3)(x-2)} = \frac{-(x-2)}{(x-3)}$
 hole at $x=2$

$$VA: x = 3$$

Find the horizontal or oblique asymptote of the rational function.

32. $R(x) = \frac{20x}{x+12}$
 $\frac{20x}{x} \rightarrow 20$

$$HA: y = 20$$

33. $R(x) = \frac{4x^2-3x+7}{x-2}$
 $4x+5$
 $x-2 \overline{) 4x^2-3x+7}$
 $\underline{-4x^2+8x}$
 $5x+7$
 $\underline{-5x+10}$
 17

$$\text{Oblique Asymptote: } y = 4x + 5$$

34. $R(x) = \frac{x-5}{x^2+3}$

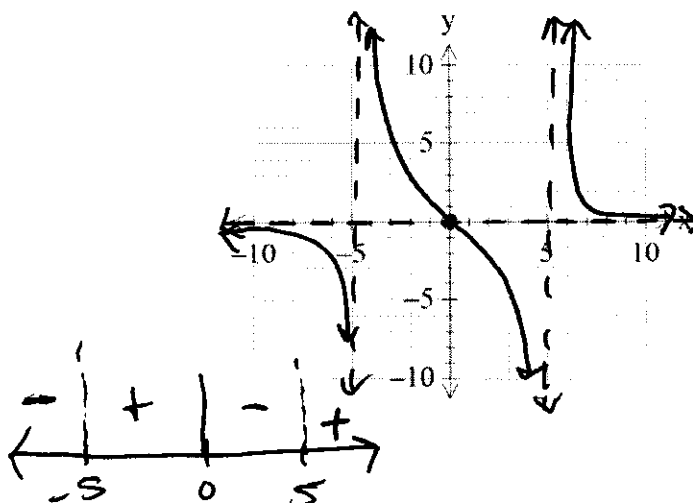
$$\frac{x}{x^2} \rightarrow \frac{1}{x} \rightarrow 0$$

$$y = 0$$

Graph the function. List all intercepts, vertical asymptotes, holes, and horizontal or oblique asymptotes.

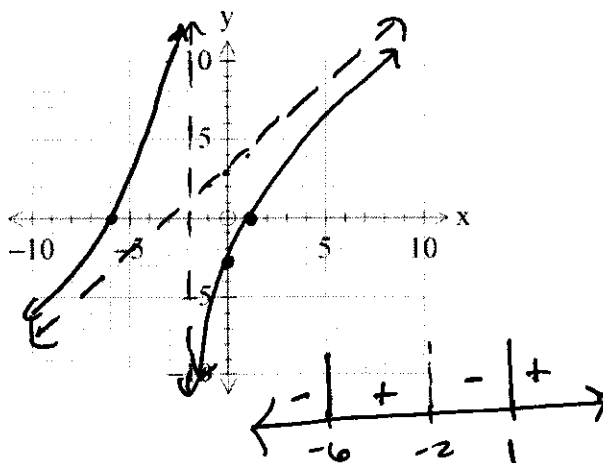
35. $R(x) = \frac{x}{x^2 - 25} = \frac{x}{(x+5)(x-5)}$

x-intercept(s)	(0, 0)
y-intercept	(0, 0)
Vert. Asympt.	$x = 5, x = -5$
Hole(s)	none
Horizontal/Oblique Asympt.	$y = 0$



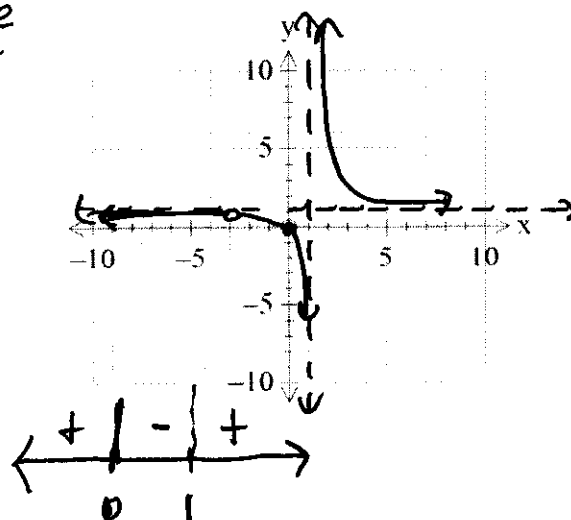
36. $R(x) = \frac{x^2 + 5x - 6}{x + 2} = \frac{(x+6)(x-1)}{x+2}$

x-intercept(s)	(-6, 0), (1, 0)
y-intercept	(0, -3)
Vert. Asympt.	$x = -2$
Hole(s)	none
Horizontal/Oblique Asympt.	$y = x + 3$



37. $R(x) = \frac{x^2 + 3x}{x^2 + 2x - 3} = \frac{x(x+3)}{(x-1)(x+3)} = \frac{x}{x-1}$

x-intercept(s)	(0, 0)
y-intercept	(0, 0)
Vert. Asympt.	$x = 1$
Hole(s)	$(-3, 3/4)$
Horizontal/Oblique Asympt.	$y = 1$



Find the average rate of change for each function in the intervals given.

38. $f(x) = -3x^2 + 1$

a) $[0, 4]$

$$f(0) = -3(0)^2 + 1 = 1$$

$$f(4) = -3(4)^2 + 1 = -47$$

$$\frac{-47 - 1}{4 - 0} = \frac{-48}{4} = \boxed{-12}$$

b) $[-1, 1]$

$$f(-1) = -3(-1)^2 + 1 = -2$$

$$f(1) = -3(1)^2 + 1 = -2$$

$$\frac{-2 - (-2)}{1 - (-1)} = \frac{0}{2} = \boxed{0}$$

39. $f(x) = \frac{3}{x-1}$

a) $[0, 2]$

$$f(0) = \frac{3}{-1} = -3$$

$$f(2) = \frac{3}{2-1} = 3$$

$$\frac{3 - (-3)}{2 - 0} = \frac{6}{2} = \boxed{3}$$

b) $[-2, 4]$

$$f(-2) = \frac{3}{-2-1} = \frac{3}{-3} = -1$$

$$f(4) = \frac{3}{4-1} = \frac{3}{3} = 1$$

$$\frac{1 - (-1)}{4 - (-2)} = \frac{2}{6} = \boxed{\frac{1}{3}}$$